

05-30-00

Practitioner's Docket No. 442-009454-US(PAR)

PATENT

## Preliminary Classification:

Proposed Class:

Subclass:

NOTE: "All applicants are requested to include a preliminary classification on newly filed patent applications. The preliminary classification, preferably class and subclass designations, should be identified in the upper right-hand corner of the letter of transmittal accompanying the application papers, for example 'Proposed Class 2, subclass 129.'" M.P.E.P. § 601, 7th ed.

## IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Box Patent Application  
Assistant Commissioner for Patents  
Washington, D.C. 20231

## NEW APPLICATION TRANSMITTAL

Transmitted herewith for filing is the patent application of

Inventor(s): Ari AHO, Kaj SAARINEN

WARNING: 37 C.F.R. § 1.41(a)(1) points out:

"(a) A patent is applied for in the name or names of the actual inventor or inventors.

"(1) The inventorship of a nonprovisional application is that inventorship set forth in the oath or declaration as prescribed by § 1.63, except as provided for in § 1.53(d)(4) and § 1.63(d). If an oath or declaration as prescribed by § 1.63 is not filed during the pendency of a nonprovisional application, the inventorship is that inventorship set forth in the application papers filed pursuant to § 1.53(b), unless a petition under this paragraph accompanied by the fee set forth in § 1.17(f) is filed supplying or changing the name or names of the inventor or inventors."

For (title):

CONTROLLING DISPLAY

## CERTIFICATION UNDER 37 C.F.R. § 1.10\*

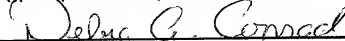
(Express Mail label number is mandatory.)

(Express Mail certification is optional.)

I hereby certify that this New Application Transmittal and the documents referred to as attached therein are being deposited with the United States Postal Service on this date May 26, 2000, in an envelope as "Express Mail Post Office to Addressee," mailing Label Number EL 336865497115, addressed to the: Assistant Commissioner for Patents, Washington, D.C. 20231.

Debra G. Conrad

(type or print name of person mailing paper)



Signature of person mailing paper

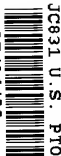
WARNING: Certificate of mailing (first class) or facsimile transmission procedures of 37 C.F.R. § 1.8 cannot be used to obtain a date of mailing or transmission for this correspondence.

\*WARNING: Each paper or fee filed by "Express Mail" must have the number of the "Express Mail" mailing label placed thereon prior to mailing. 37 C.F.R. § 1.10(b).

"Since the filing of correspondence under § 1.10 without the Express Mail mailing label thereon is an oversight that can be avoided by the exercise of reasonable care, requests for waiver of this requirement will not be granted on petition." Notice of Oct. 24, 1996, 60 Fed. Reg. 56,439, at 56,442.

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05/26/00



JC831 U.S. PTO

05/26/00 05/26/00 05/26/00



## 1. Type of Application

This new application is for a(n)

(check one applicable item below)

- ☒ Original (nonprovisional)
- ☐ Design
- ☐ Plant

**WARNING:** Do not use this transmittal for a completion in the U.S. of an International Application under 35 U.S.C. § 371(c)(4), unless the International Application is being filed as a divisional, continuation or continuation-in-part application.

**WARNING:** Do not use this transmittal for the filing of a provisional application.

**NOTE:** If one of the following 3 items apply, then complete and attach ADDED PAGES FOR NEW APPLICATION TRANSMITTAL WHERE BENEFIT OF A PRIOR U.S. APPLICATION CLAIMED and a NOTIFICATION IN PARENT APPLICATION OF THE FILING OF THIS CONTINUATION APPLICATION.

- ☐ Divisional.
- ☐ Continuation.
- ☐ Continuation-in-part (C-I-P).

## 2. Benefit of Prior U.S. Application(s) (35 U.S.C. §§ 119(e), 120, or 121)

**NOTE:** A nonprovisional application may claim an invention disclosed in one or more prior filed copending nonprovisional applications or copending international applications designating the United States of America. In order for a nonprovisional application to claim the benefit of a prior filed copending nonprovisional application or copending international application designating the United States of America, each prior application must name as an inventor at least one inventor named in the later filed nonprovisional application and disclose the named inventor's invention claimed in at least one claim of the later filed nonprovisional application in the manner provided by the first paragraph of 35 U.S.C. § 112. Each prior application must also be:

- (i) An international application entitled to a filing date in accordance with PCT Article 11 and designating the United States of America; or
- (ii) Complete as set forth in § 1.51(b); or
- (iii) Entitled to a filing date as set forth in § 1.53(b) or § 1.53(d) and include the basic filing fee set forth in § 1.16; or
- (iv) Entitled to a filing date as set forth in § 1.53(b) and have paid therein the processing and retention fee set forth in § 1.21(f) within the time period set forth in § 1.53(f).

37 C.F.R. § 1.78(a)(1).

**NOTE:** If the new application being transmitted is a divisional, continuation or a continuation-in-part of a parent case, or where the parent case is an International Application which designated the U.S., or benefit of a prior provisional application is claimed, then check the following item and complete and attach ADDED PAGES FOR NEW APPLICATION TRANSMITTAL WHERE BENEFIT OF PRIOR U.S. APPLICATION(S) CLAIMED.

**WARNING:** If an application claims the benefit of the filing date of an earlier filed application under 35 U.S.C. §§ 120, 121 or 365(c), the 20-year term of that application will be based upon the filing date of the earliest U.S. application that the application makes reference to under 35 U.S.C. §§ 120, 121 or 365(c). (35 U.S.C. § 154(a)(2) does not take into account, for the determination of the patent term, any application on which priority is claimed under 35 U.S.C. §§ 119, 365(a) or 365(b).) For a c-i-p application, applicant should review whether any claim in the patent that will issue is supported by an earlier application and, if not, the applicant should consider canceling the reference to the earlier filed application. The term of a patent is not based on a claim-by-claim approach. See Notice of April 14, 1995, 60 Fed. Reg. 20,195, at 20,205.

**Abstract** The purpose of this study was to determine the effect of a 12-week training program on the heart rate (HR) and heart rate reserve (HRR) of sedentary middle-aged men. The subjects were divided into two groups: a control group and an exercise group. The control group consisted of 10 men who did not exercise regularly, and the exercise group consisted of 10 men who participated in a 12-week training program. The HR and HRR were measured at rest and during maximal exercise before and after the training program. The results showed that the HR and HRR of the exercise group increased significantly after the training program, while the HR and HRR of the control group remained unchanged. These findings suggest that a 12-week training program can improve the cardiovascular fitness of sedentary middle-aged men.

- ☐ Declaration of Biological Deposit
- ☐ Submission of "Sequence Listing," computer readable copy and/or amendment pertaining thereto for biotechnology invention containing nucleotide and/or amino acid sequence.
- ☐ Authorization of Attorney(s) to Accept and Follow Instructions from Representative
- ☐ Special Comments
- ☐ Other

##### 5. Declaration or oath (including power of attorney)

NOTE: A newly executed declaration is not required in a continuation or divisional application provided that the prior nonprovisional application contained a declaration as required, the application being filed is by all or fewer than all the inventors named in the prior application, there is no new matter in the application being filed, and a copy of the executed declaration filed in the prior application (showing the signature or an indication thereon that it was signed) is submitted. The copy must be accompanied by a statement requesting deletion of the names of person(s) who are not inventors of the application being filed. If the declaration in the prior application was filed under § 1.47, then a copy of that declaration must be filed accompanied by a copy of the decision granting § 1.47 status or, if a nonsigning person under § 1.47 has subsequently joined in a prior application, then a copy of the subsequently executed declaration must be filed. See 37 C.F.R. §§ 1.63(d)(1)-(3).

NOTE: A declaration filed to complete an application must be executed, identify the specification to which it is directed, identify each inventor by full name including family name and at least one given name, without abbreviation together with any other given name or initial, and the residence, post office address and country or citizenship of each inventor, and state whether the inventor is a sole or joint inventor. 37 C.F.R. § 1.63(a)(1)-(4).

- ☐ Enclosed
- Executed by

(check all applicable boxes)

- ☐ inventor(s).
- ☐ legal representative of inventor(s).  
37 C.F.R. §§ 1.42 or 1.43.
- ☐ joint inventor or person showing a proprietary interest on behalf of inventor who refused to sign or cannot be reached.
  - ☐ This is the petition required by 37 C.F.R. § 1.47 and the statement required by 37 C.F.R. § 1.47 is also attached. See item 13 below for fee.

- ☒ Not Enclosed.

NOTE: Where the filing is a completion in the U.S. of an International Application or where the completion of the U.S. application contains subject matter in addition to the International Application, the application may be treated as a continuation or continuation-in-part, as the case may be, utilizing ADDED PAGE FOR NEW APPLICATION TRANSMITTAL WHERE BENEFIT OF PRIOR U.S. APPLICATION CLAIMED.

- ☒ Application is made by a person authorized under 37 C.F.R. § 1.41(c) on behalf of all the above named inventor(s).

(The declaration or oath, along with the surcharge required by 37 C.F.R. § 1.16(e) can be filed subsequently).

- ☐ Showing that the filing is authorized.  
(not required unless called into question. 37 C.F.R. § 1.41(d))

## 6. Inventorship Statement

**WARNING:** If the named inventors are each not the inventors of all the claims an explanation, including the ownership of the various claims at the time the last claimed invention was made, should be submitted.

The inventorship for all the claims in this application are:

☐ The same.

or

☐ Not the same. An explanation, including the ownership of the various claims at the time the last claimed invention was made,

☐ is submitted.

☐ will be submitted.

## 7. Language

**NOTE:** An application including a signed oath or declaration may be filed in a language other than English. An English translation of the non-English language application and the processing fee of \$130.00 required by 37 C.F.R. § 1.17(k) is required to be filed with the application, or within such time as may be set by the Office. 37 C.F.R. § 1.52(d).

☒ English

☐ Non-English

☐ The attached translation includes a statement that the translation is accurate. 37 C.F.R. § 1.52(d).

## 8. Assignment

☒ An assignment of the invention to Nokia Mobile Phones Ltd.

☐ is attached. A separate ☐ "COVER SHEET FOR ASSIGNMENT (DOCUMENT) ACCOMPANYING NEW PATENT APPLICATION" or ☐ FORM PTO 1595 is also attached.

☒ will follow.

**NOTE:** "If an assignment is submitted with a new application, send two separate letters-one for the application and one for the assignment." Notice of May 4, 1990 (1114 O.G. 77-78).

**WARNING:** A newly executed "CERTIFICATE UNDER 37 C.F.R. § 3.73(b)" must be filed when a continuation-in-part application is filed by an assignee. Notice of April 30, 1993, 1150 O.G. 62-64.

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03373060 "033060"

**9. Certified Copy**

Certified copy(les) of application(s)

Country	Appln. No.	Filed
Finland	991206	27 May 1999

Country	Appln. No.	Filed
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Country	Appln. No.	Filed
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from which priority is claimed

☒ is (are) attached.☐ will follow.

NOTE: The foreign application forming the basis for the claim for priority must be referred to in the oath or declaration. 37 C.F.R. § 1.55(a) and 1.63.

NOTE: This item is for any foreign priority for which the application being filed directly relates. If any parent U.S. application or International Application from which this application claims benefit under 35 U.S.C. § 120 is itself entitled to priority from a prior foreign application, then complete item 18 on the ADDED PAGES FOR NEW APPLICATION TRANSMITTAL WHERE BENEFIT OF PRIOR U.S. APPLICATION(S) CLAIMED.

**10. Fee Calculation (37 C.F.R. § 1.16)**A. ☒ Regular application

CLAIMS AS FILED						
Number filed	Number Extra		Rate	Basic Fee 37 C.F.R. § 1.16(a) \$ 690.00		
Total Claims (37 C.F.R. § 1.16(c))	11	- 20 =	0	×	\$ 18.00	0
Independent Claims (37 C.F.R. § 1.16(b))	2	- 3 =	0	×	\$ 78.00	0
Multiple dependent claim(s), If any (37 C.F.R. § 1.16(d))				+	\$260.00	

☐ Amendment cancelling extra claims is enclosed.☐ Amendment deleting multiple-dependencies is enclosed.☐ Fee for extra claims is not being paid at this time.

NOTE: If the fees for extra claims are not paid on filing they must be paid or the claims cancelled by amendment, prior to the expiration of the time period set for response by the Patent and Trademark Office in any notice of fee deficiency. 37 C.F.R. § 1.16(d).

Filing Fee Calculation \$ 690.00

B. ☐ Design application  
(\$310.00—37 C.F.R. § 1.16(f))

Filing Fee Calculation \$

C. ☐ Plant application  
(\$480.00—37 C.F.R. § 1.16(g))

Filing fee calculation \$

**11. Small Entity Statement(s)**

- ☐ Statement(s) that this is a filing by a small entity under 37 C.F.R. § 1.9 and 1.27 is (are) attached.

**WARNING:** "Status as a small entity must be specifically established in each application or patent in which the status is available and desired. Status as a small entity in one application or patent does not affect any other application or patent, including applications or patents which are directly or indirectly dependent upon the application or patent in which the status has been established. The refiling of an application under § 1.53 as a continuation, division, or continuation-in-part (including a continued prosecution application under § 1.53(d)), or the filing of a reissue application requires a new determination as to continued entitlement to small entity status for the continuing or reissue application. A nonprovisional application claiming benefit under 35 U.S.C. § 119(a), 120, 121, or 365(c) of a prior application, or a reissue application may rely on a statement filed in the prior application or in the patent if the nonprovisional application or the reissue application includes a reference to the statement in the prior application or in the patent or includes a copy of the statement in the prior application or in the patent and status as a small entity is still proper and desired. The payment of the small entity basic statutory filing fee will be treated as such a reference for purposes of this section." 37 C.F.R. § 1.28(a)(2).

**WARNING:** "Small entity status must not be established when the person or persons signing the . . . statement can unequivocally make the required self-certification." M.P.E.P., § 509.03, 6th ed., rev. 2, July 1996 (emphasis added).

(complete the following, if applicable)

- ☐ Status as a small entity was claimed in prior application \_\_\_\_\_ / \_\_\_\_\_, filed on \_\_\_\_\_, from which benefit is being claimed for this application under:

35 U.S.C. § ☐ 119(e),  
☐ 120,  
☐ 121,  
☐ 365(c),

and which status as a small entity is still proper and desired.

- ☐ A copy of the statement in the prior application is included.

Filing Fee Calculation (50% of **A**, **B** or **C** above)

\$ \_\_\_\_\_

**NOTE:** Any excess of the full fee paid will be refunded if small entity status is established and a refund request are filed within 2 months of the date of timely payment of a full fee. The two-month period is not extendable under § 1.136. 37 C.F.R. § 1.28(a).

**12. Request for International-Type Search (37 C.F.R. § 1.104(d))**

(complete, if applicable)

- ☐ Please prepare an international-type search report for this application at the time when national examination on the merits takes place.

**13. Fee Payment Being Made at This Time**

☐ Not Enclosed

☐ No filing fee is to be paid at this time.

*(This and the surcharge required by 37 C.F.R. § 1.16(e) can be paid subsequently.)*

☒ Enclosed

☒ Filing fee \$ 690.00

☐ Recording assignment  
(\$40.00; 37 C.F.R. § 1.21(h))  
(See attached "COVER SHEET FOR  
ASSIGNMENT ACCOMPANYING NEW  
APPLICATION".) \$ \_\_\_\_\_

☐ Petition fee for filing by other than all the  
inventors or person on behalf of the inventor  
where inventor refused to sign or cannot be  
reached  
(\$130.00; 37 C.F.R. §§ 1.47 and 1.17(i)) \$ \_\_\_\_\_

☐ For processing an application with a  
specification in  
a non-English language  
(\$130.00; 37 C.F.R. §§ 1.52(d) and 1.17(k)) \$ \_\_\_\_\_

☐ Processing and retention fee  
(\$130.00; 37 C.F.R. §§ 1.53(d) and 1.21(l)) \$ \_\_\_\_\_

☐ Fee for international-type search report  
(\$40.00; 37 C.F.R. § 1.21(e)) \$ \_\_\_\_\_

**NOTE:** 37 C.F.R. § 1.21(f) establishes a fee for processing and retaining any application that is abandoned for failing to complete the application pursuant to 37 C.F.R. § 1.53(f) and this, as well as the changes to 37 C.F.R. §§ 1.53 and 1.78(a)(1), indicate that in order to obtain the benefit of a prior U.S. application, either the basic filing fee must be paid, or the processing and retention fee of § 1.21(f) must be paid, within 1 year from notification under § 53(f).

Total fees enclosed \$ 690.00

**14. Method of Payment of Fees**

☒ Check in the amount of \$ 690.00

☐ Charge Account No. \_\_\_\_\_ in the amount of  
\$ \_\_\_\_\_

A duplicate of this transmittal is attached.

**NOTE:** Fees should be itemized in such a manner that it is clear for which purpose the fees are paid. 37 C.F.R. § 1.22(b).



## 15. Authorization to Charge Additional Fees

**WARNING:** If no fees are to be paid on filing, the following items should not be completed.

**WARNING:** Accurately count claims, especially multiple dependent claims, to avoid unexpected high charges, if extra claim charges are authorized.

- ☒ The Commissioner is hereby authorized to charge the following additional fees by this paper and during the entire pendency of this application to Account No. 16-1350:

☒ 37 C.F.R. § 1.16(a), (f) or (g) (filing fees)

☒ 37 C.F.R. § 1.16(b), (c) and (d) (presentation of extra claims)

**NOTE:** Because additional fees for excess or multiple dependent claims not paid on filing or on later presentation must only be paid or these claims cancelled by amendment prior to the expiration of the time period set for response by the PTO in any notice of fee deficiency (37 C.F.R. § 1.16(d)), it might be best not to authorize the PTO to charge additional claim fees, except possibly when dealing with amendments after final action.

☒ 37 C.F.R. § 1.16(e) (surcharge for filing the basic filing fee and/or declaration on a date later than the filing date of the application)

☒ 37 C.F.R. § 1.17(a)(1)–(5) (extension fees pursuant to § 1.136(a)).

☐ 37 C.F.R. § 1.17 (application processing fees)

**NOTE:** "... A written request may be submitted in an application that is an authorization to treat any concurrent or future reply, requiring a petition for an extension of time under this paragraph for its timely submission, as incorporating a petition for extension of time for the appropriate length of time. An authorization to charge all required fees, fees under § 1.17, or all required extension of time fees will be treated as a constructive petition for an extension of time in any concurrent or future reply requiring a petition for an extension of time under this paragraph for its timely submission. Submission of the fee set forth in § 1.17(a) will also be treated as a constructive petition for an extension of time in any concurrent reply requiring a petition for an extension of time under this paragraph for its timely submission." 37 C.F.R. § 1.136(a)(3).

☐ 37 C.F.R. § 1.18 (issue fee at or before mailing of Notice of Allowance, pursuant to 37 C.F.R. § 1.311(b))

**NOTE:** Where an authorization to charge the issue fee to a deposit account has been filed before the mailing of a Notice of Allowance, the issue fee will be automatically charged to the deposit account at the time of mailing the notice of allowance. 37 C.F.R. § 1.311(b).

**NOTE:** 37 C.F.R. § 1.28(b) requires "Notification of any change in status resulting in loss of entitlement to small entity status must be filed in the application . . . prior to paying, or at the time of paying, . . . the issue fee. . . ." From the wording of 37 C.F.R. § 1.28(b), (a) notification of change of status must be made even if the fee is paid as "other than a small entity" and (b) no notification is required if the change is to another small entity.

**16. Instructions as to Overpayment**

NOTE: "... Amounts of twenty-five dollars or less will not be returned unless specifically requested within a reasonable time, nor will the payer be notified of such amounts; amounts over twenty-five dollars may be returned by check or, if requested, by credit to a deposit account." 37 C.F.R. § 1.26(a).

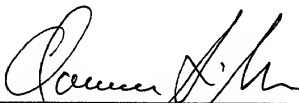
- ☒ Credit Account No. 16-1350  
☐ Refund

SEND ALL CORRESPONDENCE TO:

Reg. No. 24,622

Tel. No. (203) 259-1800

Customer No.



SIGNATURE OF PRACTITIONER

Clarence A. Green

(type or print name of attorney)

PERMAN & GREEN, LLP

P.O. Address

425 Post Road, Fairfield, Connecticut 06430

☐ **Incorporation by reference of added pages**

*(check the following item if the application in this transmittal claims the benefit of prior U.S. application(s) (including an international application entering the U.S. stage as a continuation, divisional or C-I-P application) and complete and attach the ADDED PAGES FOR NEW APPLICATION TRANSMITTAL WHERE BENEFIT OF PRIOR U.S. APPLICATION(S) CLAIMED)*

- ☐ Plus Added Pages for New Application Transmittal Where Benefit of Prior U.S. Application(s) Claimed

Number of pages added \_\_\_\_\_

- ☐ Plus Added Pages for Papers Referred to in Item 4 Above

Number of pages added \_\_\_\_\_

- ☐ Plus added pages deleting names of inventor(s) named in prior application(s) who is/are no longer inventor(s) of the subject matter claimed in this application.

Number of pages added \_\_\_\_\_

- ☐ Plus "Assignment Cover Letter Accompanying New Application"

Number of pages added \_\_\_\_\_

☒ **Statement Where No Further Pages Added**

*(if no further pages form a part of this Transmittal, then end this Transmittal with this page and check the following item)*

- ☒ This transmittal ends with this page.

## CONTROLLING DISPLAY

### FIELD OF THE INVENTION

- 5 The present invention concerns displays of electronic devices, specifically controlling displays of electronic devices

### BACKGROUND OF THE INVENTION

- 10 Displays have been incorporated to electronic devices to improve the usability of the devices. For example, presently ordinary mobile stations incorporate a display device, on which the user can monitor the success of keying in a telephone number and by using which he/she can edit the telephone number being keyed in. In tune with the evolution of mobile stations they have been used for
- 15 communicating by short messages and in future mobile station also by transferring moving images. For these uses it would be preferable for the display of a mobile station to be large so that it would be easy to recognise textual information and/or images. The size of new mobile stations has been perpetually decreasing to improve portability while the evolution of their battery technology and energy
- 20 maintenance has enabled a stretching of their standby -times even to weeks. With the future mobile station models the need for large amounts of processing required by manipulation of moving images along with an increase in display size and furthermore the transition from passive matrix displays to colour active matrix displays of better quality will significantly increase the power consumption of
- 25 mobile stations and decrease their standby-time.

- The power consumption of the liquid crystal displays now used in mobile stations, as well as that of emission displays being designed, increases relatively to their size. Thus a larger display needed to provide a larger picture area unavoidably
- 30 consumes more energy and shortens the stand-by time of the mobile station. For this reason in some mobile stations attempts have been made to circumvent this problem by e.g. turning power off from the display. On the other hand, in this case

it is impossible to show the user useful information, like strength of field or battery status, by using the display. To circumvent this problem, Panasonic's Pinocchio PHS mobile station in fact carries two displays, a large r display for using e.g. to read and write text, when the mobile station is in use, and a small display to show status information when the mobile station is in standby mode. However, this solution is space-consuming and more expensive and slower to assemble than a single-display solution due to installation of separate components. One other problem caused by displaying the status information is the marks left on the display by years of displaying same data on same place, which marks can interfere with reading the text on the display.

## SUMMARY OF THE INVENTION

Now an energy-saving display control method and an electronic device exploiting this method have been invented. The invention is based on the use of new, so-called partitionable or partially powerless coupleable display elements in a device, in which only a part of the display device is active during stand-by mode to present information useful to the user and rest of the display element is switched off to decrease the amount of energy used by the display element.

Here a display element is defined to mean an element dedicated for forming a display, which element can present several non-interdependent pixels, which pixels in turn have a common display surface. The element can be e.g. a liquid crystal display element, which comprises a group of controllable display dots and a transparent cover common to all of these dots, through which cover the dots are visible.

In a method and device according to a first embodiment of the present invention a part of the display element is switched off and only a part of the display element is used to present a certain amount of information. Where a larger display area is needed to present a larger amount of information at one time, a larger part of the display element or the entire display element can be activated.

In a method and device according to a second embodiment of the present invention an initiating row of the display element, beginning at which the use of the display of a certain part is desired, is selected from the display element, and the part of the display element surrounding the selected part is switched off, when the display is used in stand-by mode to present a certain amount of information. Alternatively, a finishing row of the display element can be selected, up to which the use of the display element is desired and the part of the display element surrounding the selected part is switched off, when the display is used in stand-by mode to present a certain amount of information. When a larger display area is needed to present a larger amount of information, a larger part of the display element or the whole display element can be activated.

In a method and electronic device according to a third embodiment of the present invention, an initiating row of the display element used, beginning at which the use of the display of a certain part is desired, is selected from the display element and the part of the display element surrounded the selected part is switched off, when the display is used in stand-by mode to present a certain amount of information. In order to avoid the appearing of permanent marks to the display element, the used part of the display element is changed, so that the same part of the display element is not constantly used to display the same information. The changes in position can be realised e.g. by moving the currently used zone of the display element to a certain direction by certain steps (e.g. up, down, to the side or diagonally), the next position is randomly selected, or the next position is selected in some other way. When a larger display area is needed to present a larger amount of information, a larger part of the display element or the whole display element can be activated.

An electronic device, which comprises a display element to present information, is characterised in that

said display element has two modes, a full-screen mode to use the entire display element to display a first information and a partial screen mode to use a

first part in which partial screen mode a second part of the display element is switched off; and that the device comprises

means for switching the device into energy conservation mode by switching the display element to said partial screen mode; and

5 means for controlling the display element during energy conservation mode to display information on said first part.

A method according to the present invention, for decreasing the energy consumption of an electronic device, is characterised in that

10 a first part of the display element is used and a second part of the display element is switched off to conserve energy; and  
information is presented on the first part of the display element

## BRIEF DESCRIPTION OF THE DRAWINGS

15 The present invention is explained in detail in the following by referring to the enclosed drawings, in which

Figure 1 presents a view on a display of a mobile station according to prior art, when the mobile station is in a stand-by mode;

20 Figure 2 presents a view on a display of a mobile station according to the present invention, when the mobile station is in a stand-by mode;

Figure 3 presents the structure of a display module of a mobile station according to a first embodiment of the present invention and its coupling to other  
25 electronics of a mobile station.

## DETAILED DESCRIPTION

Figure 1 presents the display screen of a mobile station according to prior art, when the mobile station is in stand-by mode. The display screen consists of one  
30 display element. Only a small part of the display is used, but the whole area of the display is still switched on and consuming energy, even though no information is

presented below the used part indicated in the figure with a dotted line. The use of a display element requires processing electronics or display memory in relation to the resolution of the display element and signal processing electronics, the speed of which is in relation to the resolution of the display element, that is a product of the amount of dots and the amount of colour separation bits. The energy save is due to the fact that, among others, a part of the processing electronics can be switched off or the clock frequency can be significantly lowered, as the processed display area significantly decreases. Preferably, though not necessarily, also a part of the display memory can be switched off. Of the rows of the display element row 1 or the upper edge of the display element, row 50 and row 200 or the lower edge of the display element have been marked beside the display screen in the figure.

Figure 2 presents a view on the display screen of a mobile station according to the present invention, when the mobile station is in stand-by mode. To improve comprehensibility, the information presented by the earlier presented parts of the display element has also been drawn into the figure. A mobile station according to the present invention saves energy by switching the major part of the display off and by using thin bands of the display element to present a small amount of information, so that the user knows that the mobile station is powered on and in stand-by mode. Figure 2 presents the used band B2 and the previous band B1.

Figure 3 presents the structure of a display module of a mobile station according to a first embodiment of the present invention and the display module's coupling to other electronics of the mobile station. The display module DM comprises a liquid crystal display element LCD, which supports partial screen mode, of which display element a certain part A1 can be switched on to be used. The display module also comprises a display controller DC, which also has a display memory. The display controller controls the liquid crystal display and preferably defines the active area of the liquid crystal display element, e.g. by first row RA to be used and the last row RB to be used. The display controller is in turn coupled to other electronics of the mobile station, such as a central processing unit CPU, which



supplies the display controller with the information to be presented on the liquid crystal display element. Alternatively the arrangement can be implemented in such a way that the display memory is replicated into the second memory MEM of the mobile station, to which memory applications can write directly, in which case the central processing unit takes care of updating the display element in a manner controlled by the applications. The area A1 can also be divided to the two edges of the display element, if the display element used and the display controller support it. In this way it is possible to implement the scrolling of a part exceeding one side of the display to the other side of the display element.

A display arrangement according to the present invention can naturally be controlled in several different ways, e.g. by moving the band in leaps by randomly selecting the position of the used band in set intervals or by changing the position in a certain order in certain intervals or alternatively a part of the display element can be switched off first and then the switched-off part can be increased until only the certain area A1 is in use etc. For example, the power consumption of a 200-line liquid crystal display element can in normal mode be 10 mW and in 50-line stand-by mode 6.5 mW. The difference increases stand-by time significantly. The stand-by time of a mobile station according to the present invention, which station uses a passive matrix display, has been estimated to grow with the use of a partial screen mode by some 33%, when 75% of the display area is switched off in stand-by mode. The significance of the invention is accentuated when an active matrix display is used. In that case a corresponding 75% decrease in the used area of the display element corresponds in one case to an increase in calculated stand-by time of over 100%. Such an increase in stand-by time is profitable, because neither the manufacturing cost nor the weight of the mobile station significantly increases from it.

According to an alternative embodiment of the present invention a certain e.g. rectangular part of the display element is used, which part does not need to border to any edge of the display element. In this example both the display controller and display memory are external and are located outside the display.

Thus an arrangement according to the present invention can be implemented in a way where an active area is selected by defining a first and last line for it and by selecting a certain part from this band, outside which part only empty space is displayed. In this way at least the amount of display memory needed is

- 5 decreased, because, compared to the width of the entire display, a smaller part of the display element is used.. In this case the necessary information transfer from the memory to the display controller is decreased as is the need for information transfer from display controller on to the display controller. The area formed in this manner can preferably be freely selected from the area of the display element.
- 10 This possibility can be exploited by moving the used part of the display element (also) in horizontal direction, which makes it possible to avoid display burn-in and create visual effects in an energy-saving way. It is of course possible to move the part also in vertical direction, which means that the embodiment allows movement in two directions, i.e. also diagonally.

15 A display arrangement according to the present invention can also be developed further among others in such a way that one part of a display element divided to three or more parts are switched off and a second and a third part are switched on on both sides of the switched-off part. In this case e.g. by scrolling the thin band in

20 use on the display element from the first edge of the display element (e.g. from upper edge or from the side) towards the other edge of the display element and when the band reaches the edge by continuing the part of the band moving "out" of the display element again onto the first edge of the display element. E.g. from a 200-row display element rows 1-7 and rows 189-200 could be in use or active at

25 the same time. Alternatively the display controller of a device according to the present invention can be placed outside the display module itself, e.g. integrate it into the central processing unit of the device or to other electronics, preferably to a microcircuit.

30 The information displayed in stand-by mode can cover e.g. an indicator of field strength, and indicator of battery status, a keylock symbol, an operator name, time

of day, date or other useful information. Displaying the information also indicates to the user that the mobile station is ready for use, but now in stand-by mode.

The invention is suitable e.g. for decreasing the energy consumption of active and passive matrix liquid crystal displays. The invention is not restricted to liquid crystal displays, but is suitable for all such displays (e.g. electroluminescence- and photoluminescence-based displays), on which a part of the display element can be switched off and the power consumption of the display is dependent on the amount of image particles on the part switched on. The present invention is suitable for decreasing the energy consumption of all devices comprising such a display element. The present invention is especially well suited for portable battery-driven devices such as electronic games, miniature televisions, video cameras, digital cameras and mobile stations, where the present invention makes possible a stand-by time longer than prior art, as well as to light-emitting devices such as electro-luminescence displays of computers. Even though the last mentioned computer displays can be coupled to mains voltage, energy conservation is attempted for environmental reasons.

This has been a presentation of the implementation and embodiments of the present invention through examples. It is obvious to a man skilled in the art that the present invention is not restricted to the details of the embodiments presented above and that the present invention can be implemented in other embodiments without deviating from the characteristics of the present invention. The presented embodiments should be considered illuminatory but not restrictive. The present invention can be implemented e.g. by using the display element in a transversal position with respect to figure 2, in which case a part of the columns of the display element can be left in use. Thus the implementation and use possibilities of the present invention are indeed only restricted by the enclosed patent claims. Therefore the various implementation possibilities of the present invention as well as equivalent implementations belong to the scope of the invention.

## CLAIMS

1. An electronic device, which comprises a display element to display information, wherein

5           said display element has two modes, a full-screen mode to use the entire display element to display a first information and a partial screen mode to use a first part in which partial screen mode a second part of the display element is switched off; and the device comprises

10           means for switching the device into energy conservation mode by switching the display element to said partial screen mode; and

          means for controlling the display element during energy conservation mode to display information on said first part.

2. A device according to claim 1, wherein

15           said first part comprises a certain amount of image particles, and the power consumption of the display element corresponds to the amount of said image particles.

3. A device according to claim 1, which comprises changing means for changing the position of the first part of the display element on the display element.

4. A device according to claim 3, the changing means for changing of which has been arranged to randomly change the position of said first part.

5. A device according to claim 3, the changing means of which has been arranged to change the position of said first part by scrolling the position on the display element.

6. A device according to claim 3, wherein  
30           said first part comprises a certain amount of rows.

7. A device according to claim 3, wherein  
said first part comprises a certain amount of columns.

8. A device according to claim 1, which device comprises  
5 means for measuring idle time; and  
means for switching the device to an energy conserving mode in  
response to said idle time reaching a certain value.

9. A device according to claim 1, which device comprises means for ending the  
10 energy conserving mode in response to one of the following events: user input,  
incoming call, an increase in the amount of displayed information at least equal to  
a certain lower threshold and a combination of these.

10. A device according to claim 1, which device is a mobile station.

11. A method for decreasing the energy consumption of an electronic device,  
15 wherein

a first part of the display element is used and a second part of the  
display element is switched off to conserve energy; and

20 information is presented on the first part of the display element.

## ABSTRACT

An energy-conserving mobile station and a means for reducing the energy consumption of a mobile station and to reduce burn-in on the display element, where a part of the liquid crystal display element (LCD) of a mobile station is switched off, when the whole display element is not needed and a limited amount of information is displayed on the switched-on part of the display element (A1). An arrangement according to the present invention can be implemented by e.g. driving the control circuit (DC) of the liquid crystal display that supports the partition of the display element to switch of certain rows of the display element in energy conservation mode and switching them on to be used, when information is desired to be displayed on all of the display element.

Figure 3

1/2

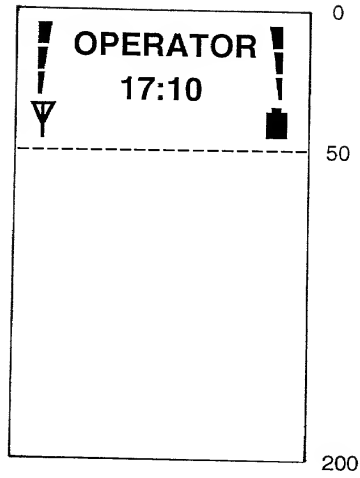


Fig. 1

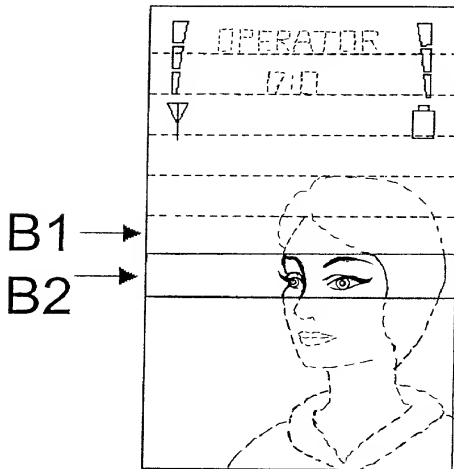


Fig. 2

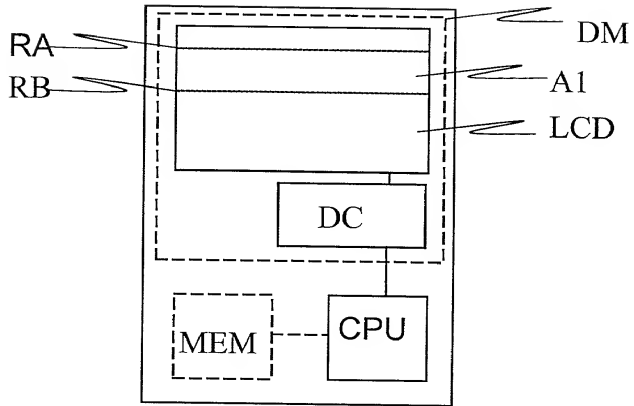


Fig. 3